Citation:

Järvinen R, Knekt P, Rissanen H, Reunanen A. Intake of fish and long-chain n-3 fatty acids and the risk of coronary heart mortality in men and women. *Br J Nutr*. 2006 Apr; 95(4): 824-829.

PubMed ID: 16571163

Study Design:

Prospective Cohort Study

Class:

B - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

POSITIVE: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To examine the relationships between the consumption of fish and fish-specific fatty acids and the risk of coronary heart disease (CHD) in men and women drawn from a population-based cohort in Finland.

Inclusion Criteria:

- Aged 30 to 79 years
- Participating in the Finnish Mobile Clinic health examination survey
- Willingness to participate in an interview on dietary habits.

Exclusion Criteria:

- CHD at entry
- Aged <30 or >79 years
- Unwillingness to participate in an interview about dietary habits.

Description of Study Protocol:

Recruitment

- Individuals residing in six regions (rural, semi-urban and industrial) were invited by the Finnish Mobile Clinic to participate in a large health examination survey. Of the 62,440 participants, approximately one in five was randomly selected for an interview on his or her dietary habits
- 5,220 individuals participated and were followed for a mean duration of 21.5 years.

Design

Prospective cohort study.

Dietary Intake/Dietary Assessment Methodology

- At baseline, data on total habitual food consumption during the preceding year were collected using a dietary history interview method
- A pre-formed questionnaire listing more than 100 different foods and food groups was used to guide structured interviews
- The type of fish and method of preparation was specified during the interview. A total of 26 different fish items were recorded in the interviews
- Artificial food models or samples of real food were used to assist respondents in participants' estimation of the amounts of food consumed. Nutrient intakes from all food items were computed using a food composition database mainly compiled from Finnish food composition
- The estimation of dietary fatty acids was based on the analyzed values of Finnish foods as presented in a previous study. Data on demographic characteristics, smoking, diseases and medicines were provided by a self-administered questionnaire.

Intervention

- Fish consumption (consumption of fish-specific fatty acids)
- Smoking habits were categorized as follows: Non-smokers; ex-smokers; pipe or cigar smokers; those who smoked less than 15 cigarettes per day those who smoked 15 or more cigarettes per day
- Height and weight were measured and BMI (kg/m^2) was calculated
- Blood pressure was measured with the auscultatory method with the subject in a sitting position. Four hypertension categories were formed on the basis of systolic and diastolic blood pressure (SBP and DBP) and anti-hypertensive medication.
- Blood samples were collected and total cholesterol concentration in serum samples was determined by an autoanalyser modification of the Liebermann-Burchard reaction. The general linear model was used to estimate the adjusted means of the selected characteristics of the study subjects in the quintiles of fish intake.

Statistical Analysis

- The relative risks (RR) of mortality in the quintiles of fish and other dietary components using the lowest quintiles as the referent category were computed based on Cox's model
- Intakes of fatty acids were first adjusted by the residual method
- Age and energy intake were included in the model as continuous variables
- In further analysis, potential non-dietary confounders were added to the model: BMI and serum cholesterol were included as continuous variables and geographical area (six regions), smoking (five categories), hypertension (four categories), occupation (agricultural, industrial, blue-collar workers; white-collar workers; housewives) and diabetes (no, yes) were added as categorical variables. In additional analyses of several dietary factors (dietary fiber, vitamin E, vitamin C, β-carotene, flavonoids, vitamin B_6 and folic acid) were also taken into account by adding them as continuous variables in the model
- Testing for the trend for association between the intake of fish and n-3 fatty acids and CHD risk was carried out by including the variables as continuous in the model.

Data Collection Summary:

Timing of Measurements

One time data collection:

- Data on total food consumption during the preceeding year were collected via interview
- Mean duration of follow up for CHD was 21.5 years.

Dependent Variables

Risk of coronary heart mortality and development of CHD.

Independent Variables

Consumption of fish and intake of long-chain n-3 fatty acids.

Control Variables

Due to the fact that fish consumption was clearly associated with better dietary habits, researchers carried out analyses including adjustments for several dietary factors that may appear as potential confounders in the analysis of CHD risk. These factors include dietary fiber, vitamin E, vitamin C, β-carotene, flavonoids, vitamin B_6 and folic acid.

Description of Actual Data Sample:

- *Initial N:* 5,220 total (2,775 males, 2,445 females)
- *Attrition:* No mention of attrition. Data given for all 5,220 subjects.
- *Age:* 30 to 79 years
- *Ethnicity:* Finnish (no other details given)
- *Other relevant demographics:* Free of CHD at enrollment
- *Location:* Finland (six regions including rural, semi-urban, industrialized).

Summary of Results:

- Higher consumption of fish was associated with a decreased risk of CHD among women, whereas no significant (NS) association was seen among men
- The relative risk between the highest and the lowest quintile for fish consumption was 1.00 (95% CI: 0.70, 1.43; P=0.83) for men and 0.59 (95% CI: 0.36, 0.99; P=0.02) for women in analysis adjusting for age, energy intake, geographical area, BMI, serum cholesterol, blood pressure, smoking, occupation and diabetes; however, after adjustment for dietary confounders this association was no longer significant
- The intake of n-3 fatty acids was NS associated with the risk of CHD in either men or women.

Author Conclusion:

Results of this study (for women) are in line with the suggested protective effect of fish consumption against CHD but a similar association was not, however, found in men.

Reviewer Comments:

No funding source was stated.

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions		
1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	Yes
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	Yes

Validity Questions		
1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	N/A
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	Yes
3.	**Were study groups comparable?**	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	Yes
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	Yes

3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	N/A
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	N/A
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	N/A
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	N/A
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	N/A
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	N/A
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A

6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	No
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	Yes
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	???
6.6.	Were extra or unplanned treatments described?	No
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	Yes
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	Yes
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes

8.6.	Was clinical significance as well as statistical significance reported?	Yes
8.7.	If negative findings, was a power calculation reported to address type 2 error?	Yes
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**	Yes
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**	???
10.1.	Were sources of funding and investigators' affiliations described?	???
10.2.	Was the study free from apparent conflict of interest?	???